the Australian, the Indo-Malayan, the African and American sections.

This forms a basis for considering their birth place and their migrations during the geological time illustrated by three maps, showing their present distribution and the probable routes of dispersal in the Triassic and Jurassic periods. The Australian species form the typical genus *Xyleutes*, these originated in Australia and developed there. To explain the migrations we must accept the ancient Southern Continent of Gondwana, at the beginning of the Secondary period. There were at least three primitive centres of dispersion, Australia, Insulindia and Lemuria. This, with the generic groupings arrived at, show that in reality the *Xyleutes* have a polyphyletic origin. Their spread was already complete in tertiary times. In this it is difficult to accept literally the statement that the origin of *Xyleutinae* is polyphyletic, and we doubt if Prof. Houlbert means this, though he says so in so many words, his real meaning we take to be that the ancestors of the family, already *Xyleutinae*, spread over the Gondwana Continent, and the several groups he recognises developed thereafter, of course separately.

The essay is founded on a large amount of material in the Oberthür collection, and shows much thoughtful study. He gives a systematic catalogue of the tribe, showing 72 species. His new genera are largely compounds of *Cossus* (*Melanocossus*, *Neocossus*, etc.), though why *Cossus* after considering *Xyleutes* to be nearer *Zeuzera* than *Cossus*, is not very clear.

The Coloration Problem. II.

By W. PARKINSON CURTIS, F.E.S.

(*Continued from vol. xxviii., page 246.*)

The record for 1916 is meagre; this must be explained at once. I had much less opportunity than usual for observation, the institution of summer time having the effect of entirely spoiling my before breakfast outings, we had a number of disastrous fires on our best hunting grounds, due to incendiarism, and we had an opportunity not to be missed of studying the habits of two non-insectivorous birds under exceptionally favourable circumstances, the record, however, carried up to September 30th, 1916. In some cases below I have set out the times of the visits where I considered they were of importance, in other cases I have condensed the account as much as possible. My reason for giving the details will appear more fully in the arguments which will occupy the third section of my remarks.

The evidence.

The times given are mean solar time in every instance.

1. **Corvus monedula, L.** The Jackdaw.
Corvus frugilegus, L. The Rook.

Observer.—W. P. Curtis and Laura M. Cook.
Time.—Evening.
Sex.—?
Date.—May 27th and 28th, 1916.
Duration.—About one hour.
Place.—Rew Down, Isle of Wight.
Food.—Large crowds of birds came up from the rookeries and the

cliffs just after sundown on to the top of the Downs, but I was unable to find out what they came up for. The second evening, however, we got into close proximity to one of the crowds, and Miss Cook called my attention to the antics of the birds as they walked. We stayed to watch them. The actions, which were quite grotesque, being a Corvine attempt to emulate the airy feats of the *Motacillas*, were due to the efforts of the bird to catch *Hepialus lupulinus*, as it buzzed amongst the short grass. They seemed pretty successful as long as the insect kept moving, but were nonplussed directly it sat down. The careful way the birds scrutinised the resting place was most interesting. The birds made exceedingly short work of the insects, treating them like oysters and swallowing them wings and all at a gulp. Their appetites are notoriously voracious, but the matter-of-fact way they kept at the slaughter of the "Swifts," as long as they could see them, was astonishing. This, of course, accounted for the congregations of the previous evening.

[Note.—On the whole I think this is a valuable observation. We had the birds as close as 30 yards. I could see the iris of the bird's eyes quite distinctly. I could see the moths quite distinctly, so distinctly that even had I not known that *H. lupulinus* was flying in thousands I could have identified it with certainty at the distance. I estimated the number of Rooks and Jackdaws in the four acres or so of clear around us at 350, but probably that was an under estimate. It is very difficult to estimate and impossible to count. I would remark on this, that I am absolutely positive of the identity of captors and of captures, and I particularly call attention to the fact that when the *H. lupulinus* sat down the birds had great difficulty in seeing them. Speaking for myself, I have found that *H. lupulinus* sitting low down in grass is very hard indeed to see, and I might add that though I knocked down and examined a number there were none of the white *fusca* form amongst them. The Downs at this point are well covered, and do not exhibit the customary bare patches.]

2. **Sturnus vulgaris, L.** The Starling.

Observer.—E. H. Curtis. Time.—?
Date.—June 1st, 1913. Sex.—?
Place.—Berewood, Dorset. Duration.—Casual.
Food.—Flies (species ?). He caught one big fly and beat it on the ground, but picked it up and took it further away every time I tried to get near enough to identify it.

3. **Chloris chloris, L.** The Greenfinch.

Observer.—W. P. Curtis. Time.—a.m.
Date.—June 5th, 1914. Sex.—♂ and ♀.
Place.—Owslebury, Winchester. Duration.—2 hours.
Food.—Feeding young at nest. 5 times by regurgitation.

Observer.—W. P. Curtis. Time.—a.m.
Date.—June 6th, 1914. Sex.—♂ and ♀.
Place, Owslebury, Winchester. Duration.—2 hours.
Food.—6 times by regurgitation.
[Note.—The regurgitated food was a white pappy mixture like

chewed oatmeal, it was impossible to say quite what it was, but I do not believe it was insect food at all.]

4. **Passer domesticus, L.** The Sparrow.

Observer.—E. H. Curtis. Time.—?
Date.—June 15th, 1913. Sex.—?
Place.—Poole. Duration.—Casual.
Food.—*Cabera exanthemata.* The insect was let out of a breeding cage, promptly pursued through three rows of sweet peas and a row of chrysanthemums, captured and carried off; a most pertinacious pursuit.

Observer.—E. H. Curtis. Time.—?
Date.—June 18th, 1913. Sex.—?
Place.—Poole. Duration.—Casual.
Food.—A similar occurrence, but the bird was infinitely quicker.

Observer.—W. P. Curtis. Time.—5.35 p.m.
Date.—July 12th, 1913. Sex.—?
Place.—Bournemouth. Duration.—Casual.
Food.—Hunted a Geometer out of a hedge, caught it and ate it. The insect was at rest, and, as near as I could tell at the distance, *Rumia luteolata.*

Observer.—W. P. Curtis. Time.—6.15 p.m.
Date.—July 23rd, 1913. Sex.—?
Place.—Bournemouth (Central Station). Duration.—10 minutes.
Food.—Caught five or six flies (*Musca* sp.?) which were walking on the glass of the station roof.

Observer.—W. P. Curtis. Time.—8.30 a.m.
Date.—July 24th, 1913. Sex.—?
Place.—Poole Station. Duration.—10 minutes.
Food.—A similar observation.

Observer.—W. P. Curtis. Time.—5 to 6 p.m.
Date.—July 31st, 1913. Sex.—Many of both sexes.
Place.—Bournemouth and Poole. ——
Food.—Catching the winged individuals of ants, which were swarming (*Lasius niger?*).

Observer.—W. P. Curtis. Time.—9.5 a.m.
Date.—August 1st, 1913. Sex.—?
Place.—Poole (Station). Duration.—5 minutes.
Food.—A similar observation to July 24th.

Observer.—W. P. Curtis Time.—5.30 p.m.
Date.—August 1st, 1913. Sex.—?
Place.—Bournemouth. Duration.—Five minutes.
Food.—A similar observation to July 31st. On this occasion a young bird, after catching several ants, got hold of a honey bee (*Apis mellifica*) worker by mistake. It dropped the bee like a hot brick. The bee went off with an angry swinging flight, apparently none the worse, but the sparrow, after shaking its head very vigorously for a bit rubbed its bill very hard against the edge of the kerb. It had evidently been stung.

Observer.—E. H. Curtis. Time.—?
Date.—June 22nd, 1914. Sex.—♀.
Place.—Poole. Duration.—Casual.
Food.—*Eupithecia* (sp. ?), attack not completed; bird alarmed by E.H.C.

Observer.—W. P. Curtis. Time.—9.45 a.m.
Date.—July 10th, 1914. Sex.—♀.
Place.—Littledown Rd., Bournemouth. Duration.—Casual.
Food.—Came out of a fir tree with a grey *Noctua* held across the thorax with wings spread each side of the bill. Prey looked like *Acronycta psi* or *A. tridens* (the former is fond of sitting on fir trees here). Before I could make sure a ♂ *P. domesticus* tried to rob the captor, who fled incontinently with ♂ in pursuit under forced draught. I am morally certain the insect was taken at rest.

Observer.—W. P. Curtis. Time.—1.45 p.m., *circa*.
Date.—September 23rd, 1914. Sex.—?
Place.—Pleasure Gardens, Bournemouth. Duration.—Casual.
Food.—Bird came out of a bush with *Orthosia macilenta*, rubbed the insect on the ground to get the fluff off, caught sight of W.P.C. and bolted back.

Observer.—E. H. Curtis. Time.—?
Date.—March 21st, 1914. Sex.—?
Place.—Canford, Dorset. Duration.—Casual.
Food.—A Dipterous fly, hawked after the manner of *Muscicapa griseola*.

Observer.—W. P. Curtis. Time.—?
Date.—May 26th, 1914. Sex.—?
Place.—Poole. Duration.—Casual.
Food.—*Pieris brassicae*.

Observer.—J. T. Curtis. Time.—?
Date.—June 1st, 1914. Sex.—?
Place.—Poole. Duration.—Casual.
Food.—*Melanippe fluctuata* disturbed by garden hose; two sparrows hustled each other and the insect escaped.

[Note.—Number of attacks on insects recorded 13. Out of the 13, eight were on Lepidoptera, 6 of these were successful. Out of the same 8 two were certainly and a third almost certainly (a 99% certainty) at rest.]

5. **Fringilla coelebs, L.** The Chaffinch.

Observer.—E. H. Curtis. Time.—1.10 to 4 and 4.10 to 4.35.
Date.—May 16th, 1915. Sex.—22 ♂, 4 ♀
Place.—Canford, Dorset. Duration.—3 hours and 25 minutes.

[Note.—26 visits to the nest.]

Observer.—E. H. Curtis. Time.—11.10 to 12.50.
Date.—May 23rd, 1915. Sex.—9 ♀, 3 ♂.

Place.—Canford, Dorset. Duration.—1 hour 40 minutes.
[Note.—12 visits to the nest.]

Observer.—E. H. Curtis. Time.—1.45 to 4.5.
Date.—May 23rd, 1915. Sex.—7 ♀, 9 ♂.
Place.—Canford, Dorset. Duration.—2 hours 10 minutes.
[Note.—16 visits to the nest.]
Food.—The food on every occasion was entirely green or pale yellowish-green Lepidopterous larvæ, mostly *Geometrae*.

Observer.—W. P. Curtis. Time.—9.40 a.m.
Date.—July 15th, 1916. Sex.—♀.
Place.—Broadstone, Dorset. Duration.—Casual.
Food.—Hunted a *Camptogramma bilineata* out of a hedge into the open, and into the hedge again, could not see if attack completed.
[Note.—There are here 55 observations, only one of which is an attack on a lepidopterous imago, and it is not known whether that one was completed, but the one attack was on an insect at rest.]

6. **Emberiza citrinella, L.** The Yellow Bunting.

Observer.—W. P. Curtis. Time.—Morning.
Date.—June 1st, 1914. Sex.—♂ and ♀.
Place.—Widdam Down, Owslebury. Duration.—40 minutes.
Food.—Observations at nest. Both parents fed with beetles and insects; but I had lost my pencil and could keep no proper note, moreover, the birds poked through the bushes at the back of the nest.

Time.—Afternoon, 2.10. Duration.—1¼ hours.
Food.—Unidentified. Sex.—♂.

Time.—2.15. Sex.—♀.
Food.—Unidentified.

Time.—2.25. Sex.—♀.
Food.—Unidentified.
Time.—2.26. Sex.—♂.
Food.—Unidentified.

Time.—2.28. Sex.—♀.
Food.—A Hymenopterous fly. I afterwards found a fly on a clump of spruce near, from which the parents were getting food which had the coloration of this fly, but it was a Dipteron, so I may have been mistaken.

Time.—2.32. Sex.—♂.
Food.—Unidentified.

Time.—2.33. Sex.—♂.
Food.—Small black flies.

Time.—2.34. Sex.—♀.
Food.—Small beetles with red undersides to the abdomen.

Time.—3.5. Sex.—♀.
Food.—Small insects.

Time.—3.7. Sex.—♀.
Food.—No food.

Time.—3.12. Sex.—♂.
Food.—Very tiny insects.

Time.—3.22. Sex.—♂.
Food.—Unidentified.

[Note.—This was a day of brilliant sunshine with a strong breeze; insects were very lively and active. Twelve visits are recorded. I was unable to identify the food six times, no food was brought once. On the five occasions the food was identified it was insect food, but not once could I say it was Lepidoptera.]

Observer.—W. P. Curtis. Same pair of birds.
Date.—June 2nd, 1914. Duration.—2¼ hours.
Place.—Widdam Down, Owslebury. Sex.—♂ and ♀.
Time.—10.30.
Food.—A quantity of insects. Whilst he was feeding the young one of the insects escaped from his bill and bolted into the grass near the nest. It was a small *Tortrix*, and looked like *Epiblema pflugiana:* the bird followed it, and after a hunt captured it, and stuffed it wings and all down a young bird's throat.

Time.—10.40. Sex.—♂
Food.—Unidentified.

Time.—10.47. Sex.—♂.
Food.—Unidentified. Up to this time the ♀ had merely been sitting on a bush uttering a mournful squeak, she now joined the ♂ in feeding the family.

Time.—10.48. Sex.—♀.
Food.—Unidentified.

Time.—10.56. Sex.—♀.
Food.—No food.

Time.—10.57. Sex.—♂.
Food.—Unidentified.

Time.—11.3. Sex.—♀.
Food.—Very small insects.

Time.—11.6. Sex.—♀.
Food.—Tiny black insects.

Time.—11.13. Sex.—♀.
Food.—Small insects.

Time.—11.18. Sex.—♀.
Food.—Small insects.

Time.—11.33. Sex.—♀.
Food.—Three Crambites. *Crambus dumetellus* was common in the neighbourhood, and I had a good opportunity of seeing the insects. I do not think they were *Crambus pratellus*. I went out on the down immediately to ascertain for certain what insects there were about. During this period the ♂ was singing.

Time.—12.15. Sex.—♂.
Food.—Four Crambites.

Time.—12.15. Sex.—♀.

Food.—Unidentified. (I had to go out here to drive away sheep, and this disturbed the birds.)

Time.—12.29. Sex.—♂.
Food.—Unidentified.

Time.—12.30. Sex.—♀.
Food.—Unidentified.

Time.—12.30. Sex.—♂.
Food.—Unidentified.

Time.—12.35. Sex.—♂ and ♀.
Food.—Unidentified.

Time.—12.40. Sex.—♂.
Food.—Unidentified.

Time.—12.42. Sex.—♂.
Food.—Unidentified.

Time.—12.45. Sex.—♀.
Food.—*Epiblema* (sp. ?) and 3 *Crambus dumetellus*. (?)

Time.—12.45. Sex.—♂.
Food.—*Coenonympha pamphilus*.

[Note:—I had to leave at this point and the next day when I hoped to continue I found the young had quitted. This day was dull and thundery and very few insects were moving. I saw no Lepidoptera moving except those I kicked up. 21 visits are recorded. On twenty occasions food was brought; I failed to identify it eleven times. The other nine times it was always insects and five times out of the nine it was Lepidoptera or partly Lepidoptera, which were I feel certain taken at rest. I particularly draw attention to the number brought, *viz.*, thirteen in five visits. Also to the time taken. The ♀ took a quarter of an hour to get three Crambites. The ♂ was about ten minutes getting four. The ♀ ten minutes getting one *Epiblema* and three *Crambites* whilst the ♂ was exactly three minutes getting the *C. pamphilus*.]

[Note:—With regard to times my brother and I have had occasions to work at one nest with two hiding tents, each independently noting his own times, and we were unable to check as I cannot hear him speak (unless he shouts very loudly) through the two thicknesses of tent material, we have been surprised after to find that we rarely vary a second on times if we synchronize our watches at the start as we usually do, so I think it may be assumed that the times recorded above are correct to within a second or two.]

Observer.—E. H. Curtis. Time.—?
Date.—August 16th, 1914. Sex.—♀.
Place.—Swanage, Dorset. Duration.—Casual.
Food.—Grasshopper.

[Note:—Total 34 records. Food brought 82 times. Food identified sixteen times. Insect food every time. Lepidoptera brought five imes.]

(To be continued.)